Description

Mobile communications terminal

The present invention relates to a mobile communications terminal, in particular a mobile telephone, according to the preamble to claim 1.

Mobile communications terminals and mobile telephones have a display to present different types of information. This information may, for example, relate to the mobile radio network operator, the battery level, the telephone number or text information transmitted during a communications link. In conventional mobile telephones, this display is designed in the form of a black-and-white liquid crystal display. More recent equipment already has, in some cases, a color graphics display.

Due to advancing further development of existing mobile radio networks and the introduction of correspondingly more powerful mobile radio systems, mobile communications terminals are increasingly equipped with multimedia user facilities. Third-generation mobile radio systems are generally referred to by the term UMTS (Universal Mobile Telecommunication System). Due to the development of UMTS, voice, graphics, video and other broadband services are intended to be combined with one another and offered to subscribers, with the aim of producing a worldwide, universal mobile radio standard. This means that these communications services are intended to be offered to every subscriber, regardless of his current location, the network in which he is currently located, or the terminal which he is currently using.

A substantial component of the desired UMTS mobile radio standard, which is to be introduced from 2001, is

represented by the aforementioned implementation of multimedia user facilities, i.e. a comprehensive

and flexible range of services comprising voice, data and image transmission is to be provided. Videotelephony or Internet access, for example, are also intended to be provided.

However, corresponding mobile communications terminals must be equipped with color displays for multimedia user facilities of this type, although these, even in non-illuminated mode, have a relatively high power consumption, given that a power of several times 10 mW is required simply to refresh the color pixel matrix of such color displays. In any case, even in standby mode, i.e. when no communications link exists, specific user information must be displayed to inform the user, for example, of a link to the mobile radio network operator or the battery level of the mobile terminal, etc. The use of conventional color displays would therefore substantially reduce the standby time, whereas the aim is to prevent this.

The aforementioned problem could be eliminated by providing two different displays, a color display being used to present multimedia communications information and a conventional display being used to present the aforementioned miscellaneous user and standby information. However, this solution would result in a disadvantageous increase in production costs and space requirement.

The object of the present invention is therefore to propose a mobile communications terminal in which the aforementioned problem is eliminated. In particular, a mobile communications terminal is to be created which, on the one hand, is suitable for operation in mobile radio networks with multimedia user facilities and which, on the other hand, minimizes power consumption for the presentation of corresponding information on a display of the mobile communications terminal.

This object is achieved according to the present invention by means of a mobile communications terminal with the features of claim 1. The subclaims describe preferred and advantageous embodiments of the present invention.

According to the invention, the display of the mobile communications terminal is divided into two display areas. The first display area is provided for the presentation of (multimedia) communications information, and the second display area is provided exclusively for the presentation of miscellaneous user information, which is displayed in particular when the terminal is in standby mode. The mobile communications terminal according to the invention is designed in such a way that, for the duration of the standby mode, or for the duration of an operating mode in which no multimedia communications information is to be presented, only the first display area provided for the presentation of miscellaneous user information is activated, whereas the display area provided for the presentation of communications information remains deactivated.

The surface of the display area provided for the presentation of miscellaneous user information is advantageously small compared with the total display surface or the surface of the display area provided for the presentation of (multimedia) communications information, so that, in the absence of communications information which is to be presented, the power consumption can be reduced according to this surface ratio. In particular, in the absence of communications information which is to be presented, only the display area provided for the presentation of miscellaneous user information is regularly refreshed.

The display is advantageously designed in the form of an alphanumeric, active-matrix liquid crystal color display.

With the aid of the present invention, high-resolution color displays (video displays) can be operated in a power-saving or energy-saving manner, since only a partial surface (for example the upper, lower or lateral edge of the display) is made available for the presentation of miscellaneous user information (e.g. status information), which does not correspond to multimedia communications information which is transmitted during a communications link to the mobile communications terminal. If the standby mode is ended and multimedia communications information is available and is to be presented on the terminal display, the entire terminal display is refreshed and, in normal mode, the multimedia communications information is presented on one display area and the miscellaneous user information, e.g. the battery level or the like, is presented on the other display area.

The invention is explained below with reference to preferred embodiments and to the drawing.

Fig. 1 shows a simplified block diagram of a mobile communications terminal according to the invention.

Fig. 2a and Fig. 2b show presentations of the status of the display of the mobile communications terminal shown in Fig. 1 in standby mode and normal mode, and

Fig. 3 and Fig. 4 show display conditions in standby mode according to variants of the preferred embodiment explained with reference to Fig. 1 and Fig. 2.

Fig. 1 shows a simplified block diagram of a preferred embodiment of a mobile communications terminal according to the present invention. This terminal comprises an antenna 1, a transmit unit 2 and a receive unit 3, which collectively form the air interface

of the terminal and are used to set up a communications link with a base station of the corresponding mobile radio network. The transmit and receive units 2 and 3 are connected to a frequency converter 5 and a unit 6 for digital signal processing of the communications information which is to be transmitted or received. A unit 7, which acts as the interface between the mobile terminal and a user of the mobile terminal (man-machine interface), is connected to the unit 6. In particular, a keypad 8 and a microphone 9 are connected to the man-machine interface 7 to enter information, and also a loudspeaker 10 and a display 13 to output information. The display 13 is controlled by a display controller 11. A unit 4 is connected to the internal structure of the mobile terminal to supply power to the entire mobile terminal, and said unit may also have a battery voltage regulator to maintain the supply voltage at a constant level. The aforementioned mobile terminal components, as shown in Fig. 1, correspond to the intrinsically customary components of conventional mobile telephones, which do not therefore need closer examination at this point.

However, a special feature of the present invention is the design of the display 13, which is provided in particular in the form of a color display, for example an active-matrix liquid crystal color display. The display 13 is designed in particular in such a way that it serves not only to display multimedia communications information which is received by the receive unit 3, for example, in particular while a communications link exists, but also to present miscellaneous user information, for example, which is not communications information in the true sense and which, for example, provides information on specific conditions of the mobile terminal. For this purpose, the display surface of the display 13 is divided into two partial areas, the first partial area being provided exclusively

for the visual presentation of the aforementioned (multimedia) communications information, whereas the second partial area is provided in particular for the visual presentation of miscellaneous user and status information. The display controller 11 is designed according to the present invention in such a way that, if no communications information is to be presented (for example, in standby mode), it activates and regularly refreshes only the aforementioned second partial area of the display surface 13 in order to present the aforementioned miscellaneous user information, whereas the first partial area provided for the presentation of communications information is deactivated. The first partial area remains in particular deactivated until communications information to be presented occurs once more, having been obtained in particular during a multimedia communications connection (e.g. videotelephony, Internet retrieval). In this case, the entire display surface of the display 13 is activated and refreshed, so that, in the present case, both the aforementioned user information and status information and the multimedia communications information are presented in the corresponding partial areas of the display 13. This will be explained in detail below with reference to the presentations shown in Fig. 2.

Fig. 2a shows a typical structure of the display 13. The display 13 is structured in particular in the form of a matrix and comprises a plurality of pixel lines 14, some of which are allocated to the partial area 16 for the presentation of multimedia communications information, while others are allocated to the partial area 15 for the presentation of miscellaneous user and status information. Fig. 2a shows in particular the condition of the display 13 when the corresponding mobile communications terminal is in standby mode, i.e. it shows the case in which there is no multimedia

communications information to be presented. In this case, only the pixel lines corresponding to the partial area 15 are activated and, in

particular, cyclically refreshed by the display controller 11 shown in Fig. 1, whereas the pixel lines of the partial area 16 are deactivated. Here, it must be noted that pixels activated in the presentations shown in Fig. 2 - 4 are shown with hatching and deactivated pixels are shown as white.

If the user of the mobile communications terminal switches from standby mode to normal mode and sets up a communications connection by means of which the multimedia communications information which is to be presented on the display 13 is obtained, a normal refresh of the entire display 13 is carried out by the display controller 11, so that the entire display surface, i.e. the partial area 15 and the partial area 16, is available and is activated for the display. Furthermore, the aforementioned status information can be presented in the partial area 15, whereas the multimedia communications information, such as graphics or images, are displayed in the partial area 16. It is likewise possible for communications information also to be presented in the partial area 15 which is actually provided for the status information, onto which status information can also be superimposed.

In the embodiment shown in Fig. 2, the partial area 15 provided for the presentation of miscellaneous user information and status information is disposed on the upper edge of the display 13. For visual clarity of the display 13, it is advantageous if this partial area 15 is generally provided in the circumstantial area of the display 13, whereby the partial area 15 may also be provided on the lower edge or on the lateral edge of the display 13. In order to minimize the power consumption in standby mode, it is advantageous to design the surface of the partial area 15 to be as small as possible compared with the entire display surface or the surface of the partial area 16, so that

only a minimum display surface 15 of the display 13 needs to be operated if no multimedia communications information is available, i.e. if the partial area 16 of the display 13 is not in use.

Normal color display panels can be used for the display 13, i.e. no special developments are required. The display 13 is divided into the partial areas 15 and 16 and the individual pixels of these partial areas are controlled simply depending on the display controller 11 shown in Fig. 1. This will be explained in detail below, where the control of the individual partial areas 15 and 16 of the display 13 can essentially be implemented in two different ways.

The task of the display controller 11 shown in Fig. 1 is to process cyclically the individual pixels of the display 13 and supply them with picture information. The functionality of the display controller 11 can then be adapted in such a way that, in standby mode in which no multimedia communications information is presented in the partial area 16, the display controller 11 processes only the pixels of the partial area provided for the presentation of user information or status information, i.e. in the embodiment shown in Fig. 2, only the uppermost pixel lines of the display 13 belonging to the partial area 15 are cyclically refreshed and activated in standby mode. For this purpose, the display controller 11 may have an internal line counter which is reset with each refresh cycle and counts the pixel lines of the display 13 which are instantaneously being refreshed by the display controller 11. As soon as the display controller 11 in standby mode, with reference to the internal counter level, determines that a pixel line 14 of the display 13 is to be refreshed or supplied with picture information which belongs to the partial area 16 of the

display 13, this line is no longer processed by the display

controller 11 and is therefore not supplied with picture information, i.e. the pixel lines 14 belonging to the partial area 16 of the display 13 remain dark. This procedure is repeated with each refresh cycle.

Alternatively, it is also possible in a corresponding manner to connect the display controller 11 externally to a counter 12, as shown by the broken line in Fig. 1. This means that, in addition to the conventional chip of the display controller 11, a control counter 12 is provided, which also counts the pixel lines processed by the display controller 11. Once the display controller 11 in standby mode has processed the pixel lines belonging to the partial area 15, for example the first 20 pixel lines of the display 13, it is disabled by the control counter 12. Similar to the first variant described above, the remainder of the display 13, i.e. the pixel lines 14 belonging to the partial area 16, are not processed in this case by the display controller 11, so that these pixel lines are not supplied with picture information. In this case also, this procedure is repeated with each refresh cycle, whereby the counter level of the counter 12 is reset at the start of each refresh cycle.

The control of the display 13 is of course not restricted to the embodiment explained with reference to Fig. 2, in which entire pixel lines are allocated to the partial areas 15 and 16. It is also possible for a group of individual pixels of the display 13 to be allocated to the partial areas 15 and 16 without this group forming entire pixel lines. In this case, the display controller 11 and the counter 12 would have to be adapted compared with the above description in such a way that individual pixels of the matrix-type display 13, rather than entire pixel lines, are counted and monitored, whereby, similar to the above procedure, on

reaching a pixel allocated to the partial area 16, the processing of this pixel is suppressed by the display

controller 11 so that no picture information is supplied to this pixel.

Thus, for example, the partial area 15 provided for the presentation of user information and status information can be disposed on a lateral edge of the matrix-type display 13 which is divided into pixel lines 14 and pixel columns 17. This embodiment is shown in Fig. 3.

It is similarly possible, for example, to allocate a group of pixels provided in a corner area of the display 13 to the partial area 15 for the presentation of user or status information. This embodiment is shown in Fig. 4.

List of reference numbers

1	Antenna
2	Transmit unit
3	Receive unit
4	Power supply unit
5	Frequency converter
6	Digital signal processing unit
7	Man-machine interface
8	Keypad
9	Microphone
10	Loudspeaker
11	Display controller
12	Counter
13	Display unit
14	Pixel line
15	Display area for user or status information
16	Display area for multimedia communications information
17	Pixel line